

La Crisis de la Atención de Maternidad: Experts' Perspectives on the Syndemic of Poor Perinatal Health Outcomes in Puerto Rico

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The purpose of this study was to center the voices of maternal and infant health care (MIH) clinicians and public health experts to better understand factors associated with persistently high rates of poor perinatal health outcomes in Puerto Rico. Currently, Puerto Rican physicians, midwives, and other care providers' perspectives are absent from the literature. Guided by a syndemics framework, data were collected during eighteen months of ethnographic fieldwork and through open-ended, semi-structured interviews ($n=20$). Three core themes emerged. The first two themes: (1) *Los estresores diarios: poor nutrition, contaminated water, and psychosocial stress*; and (2) *Medicina defensiva: solo obstetrics and fear-based medicine*, describe contributing factors to Puerto Rico's high preterm and cesarean birth rates. The third theme: (3) *Medicina integrada: midwives, doulas, and comprehensive re-education* explores potential solutions to the island's maternity care crisis that include improved integration of perinatal care services and educational initiatives for both patients and providers. Collectively, participants' narratives expose a syndemic of poor perinatal health outcomes that emerges from the structural vulnerability generated by decades of colonial domination embedded in the daily lives of island residents and in the Puerto Rican maternity care system.

Key words: Puerto Rico, maternal and infant health, syndemic, preterm birth, cesarean birth

Introduction

Maternal and infant health (MIH) outcomes in Puerto Rico are persistently worse than those in the continental United States (US) despite its theoretically functioning within the same maternity care system. Health care inequities are evident in multiple MIH outcomes, including elevated perinatal mortality rates (PMR). The PMR captures all demises from 28 weeks gestation to 28 days postpartum (i.e., late neonatal death) and serves as a proxy indicator for the quality of prenatal, intrapartum, and postpartum care (CDC 2018; WHO 2006). At 7.9/1000, Puerto Rico's PMR is significantly higher than the US' rate of

6/1000 (AMCHP 2018). The estimated regional PMR for the Caribbean is 31/1000 (WHO 2006). Such an elevated PMR is associated with health system deficits, including a lack of skilled providers and essential equipment (WHO 2006).

Poor perinatal health in Puerto Rico is driven by two outcomes—a high preterm birth (PTB) rate relative to both the US and other Caribbean countries and an elevated cesarean birth rate. Preterm birth (PTB), a delivery that occurs before 37 completed weeks of gestation, is the leading cause of neonatal death and the second leading cause of death for children under five, globally (Frey and Klebanoff 2016; Goldenberg et al. 2008). Puerto Rico's PTB rate is currently 11.9 percent—nearly 17 percent higher than the average for the United States (MOD 2020a). In the US jurisdiction, Arkansas, Louisiana, Mississippi, Alabama, Georgia, West Virginia, and Puerto Rico all have preterm birth rates (PTB) rates of 11.5 percent or higher (2020a). PTB rates vary in the Caribbean, ranging from 6 percent in Cuba to 14 percent in Haiti (WHO 2012). Multiple clinical, social, and environmental factors are associated with PTB, including low socioeconomic status and low educational attainment (Ferguson et al. 2019), yet two-thirds of PTBs occur without any evident risk factor (Vogel et al. 2018).

In the US states with the highest rates of PTB, institutionalized racism, poverty, teenage pregnancy, and other factors have been shown to contribute to elevated levels of

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In the 1990s, Puerto Rican governor and physician Pedro Rosselló campaigned to further “modernize” the island’s health system by modeling it after the managed care systems that were implemented in the US during the Clinton administration (Mulligan 2014). Rosselló’s health care reform plan further privatized health care on the island by dismantling diagnostic and treatments centers, including some federally qualified health centers for Medicaid and Medicare patients, despite the fact that a significant portion of the island’s population qualifies for government-funded health care (Mulligan 2014; Roman 2015). Because of legislation passed in the late 1960s capping the reimbursement rate, Medicaid and Medicare reimbursement rates for providers in Puerto Rico is currently 70 percent less than in the US, resulting in provider shortages and health service limitations (Roman 2015). If Puerto Rico were a state, the government would cover more than 80 percent of its Medicaid costs; however, the federal government reimburses the island for approximately 19 percent of its Medicaid costs in the form of block grants (Mulligan 2014). Functioning under steep economic constraints, Puerto Rico’s maternity care system continues to embrace an excessively medicalized model of perinatal care focused on the regulation and control of pregnant and birthing bodies, despite consumer calls for greater access to options like midwifery and doula care and vaginal birth after cesarean (VBAC).

Puerto Rican and US health systems share certain traits, as well as key divergences. Similarities include the availability of skilled medical staff, equipment for diagnosis and treatment, and the convenience of provider locations. Areas of divergence include lower reimbursement rates, greater political-economic inequities, lower quality and greater time spent waiting for examinations and reports, poorer treatment by the health care staff, a lower likelihood of having an identified primary care provider, lower vaccine utilization and availability, and limited responsiveness of medical institutions for referrals and appointment scheduling (CMS 2018; Numbeo 2020; Roman 2015). Of the island’s 78 municipalities, 72 of them are medically underserved (Perreira et al. 2017). Within these underserved areas, 23 percent of the municipalities need pediatricians, and 68 percent have a shortage of obstetricians and gynecologists (Kaiser Family Foundation 2018; Perreira et al. 2017). Obstetrician-attended hospital birth is the norm on the island, as other MIH providers such as midwives are not recognized or regulated in Puerto Rico, limiting options for the type of integrated maternity care systems established elsewhere in Latin America (Caban-Liani 2013; Cordova 2008). Here, we center the voices of care providers who navigate these challenges on the ground, every day. What can their perspectives teach us about the intersecting factors that generate poor MIH outcomes in Puerto Rico? What do they see as critical solutions for addressing these issues?

Methods

Data Collection

Data were collected during eighteen months of fieldwork between July 2014 and March 2018 in one large metropolitan

area in Puerto Rico as part of a larger, multi-year project on maternal stress and birth outcomes. Methods included participant observation and semi-structured interviews with MIH experts ($n=20$) collected between July and August of 2014. Here, we report findings from the expert interviews. Findings from later phases of the larger study are forthcoming. The Institutional Review Board at Oregon State University approved all phases of this study.

Potential participants for the semi-structured interviews were identified through contacts provided by two, local community-based MIH centers, *Mujeres Ayudando a Madres (CENTRO MAM)* and *Centro Pediátrico de Lactancia y Crianza*. Participants were all employed as public health professionals and/or as clinicians, working in a variety of settings including community-based MIH organizations, labor and delivery and pediatric units, academic settings, and MIH grassroots, not-for-profit organizations. We used nonprobability quota sampling (Bernard 2006) to recruit Puerto Rican MIH experts wherein individuals from the sample population of interest were told about the study by email and/or phone calls and invited to participate. The first author also created business cards that included the time frame for the study, a brief explanation of the research, and contact information for prospective participants. Experts who engaged in interviews were encouraged to share the business cards with potential participants who self-identified by contacting the first author. Participant observation occurred in MIH care clinics, not-for-profit centers, and community-based organizations after relationships with key informants and interviewees were established.

During the interviews, we used semi-structured guides so that each expert was presented with the same, open-ended questions, permitting systematic comparisons across individuals and groups. We also encouraged participants to elaborate on topics they felt helped to explain poor birth outcomes, which allowed for heterogeneity in participant responses. The first set of interview questions inquired about the primary MIH concerns in Puerto Rico. The second set of questions covered topics related to existing programs, resources, and individual ideas about how to improve MIH outcomes. Participants provided voluntary, written, informed consent; all interviews were audio-recorded and transcribed verbatim by the first author and two research assistants. Interviews were conducted in English and lasted 30 to 60 minutes. Participant names have been replaced with pseudonyms to protect confidentiality.

Data Analysis

Open, consensus coding was used to identify themes in interview transcripts and field notes. Inductive or “open” consensus coding is an approach where more than one researcher independently codes the transcripts and produces a preliminary list of topical and theoretical codes or concepts (Creswell and Poth 2013). Researchers then identify overlapping and non-overlapping themes, discussing any non-overlapping themes until consensus is reached. The first two

authors consensus coded the interview data, and then once the main themes were identified, co-developed the analysis with the third and fourth authors. We engaged in consensus coding because it allowed for a diverse range of codes to emerge from participant narratives, as researcher positionality is known to influence which themes are identified and prioritized and which are overlooked (Maxwell 2013). In addition, the use of multiple coders has been shown to add rigor to qualitative data analysis, making it more likely that findings will accurately and dependably reflect the range of experiences conveyed in the interviews (Bernard 2006). A preliminary list of codes was also shared with a voluntary sample of participants and member checked (Birt et al. 2016). Theoretical analysis and consensus coding enabled us to co-construct findings with participating MIH experts.

Results

Twenty MIH clinicians and public health professionals participated in expert interviews, representing multiple areas of expertise (see Table 1 for a summary of participant characteristics). All participants self-identified as Puerto Rican and were over the age of 17. Participants described several clinical MIH concerns, including high rates of gestational diabetes, preeclampsia, gestational hypertension, and intrauterine growth restriction. However, PTB and the high cesarean section rates were consistently reported as the greatest concerns. Three core themes emerged from expert interviews as they described the risk factors that they believe are contributing to elevated levels of preterm and cesarean birth in Puerto Rico. The first two themes: (1) *Los estresores diarios: poor nutrition, contaminated water, and psychosocial stress* and (2) *Medicina defensiva: solo obstetrics and fear-based medicine*, describe the core factors that interact to constitute a syndemic of poor perinatal health. Theme 1 describes a cluster of factors negotiated at the site of the individual, maternal body. Theme 2 describes a second cluster of systemic dysfunctions that inhibit the delivery of respectful maternity care. Clusters 1 and 2 intersect as a pregnant individual navigates care over the course of their pregnancy, birth, and postpartum period. The third theme, *Medicina integrada: midwives, doulas, and comprehensive re-education* describes the system-level changes that providers argue need to be undertaken to improve MIH outcomes in Puerto Rico.

Theme 1: *Los Estresores Diarios: Poor Nutrition, Contaminated Water, and Psychosocial Stress*

Participants argued that three pervasive and unrelenting, “everyday stressors” put Puerto Rican women at elevated risk for preterm and cesarean birth: (1) poor nutrition, (2) water contamination, and (3) psychosocial stress. Experts explained that these factors do not work in isolation. Instead, poor diet, high levels of pollution, and social stress interact to intensify the everyday experiences of stress among pregnant people in Puerto Rico.

Table 1. Professional Occupation of Interviewees

Maternity Care Profession	n (%)
Certified Professional Midwife ^a	4 (20)
Certified Nurse Midwife ^b	1 (5)
Doula ^c and Lactation Consultant	1 (5)
Labor and Delivery Nurse	1 (5)
Obstetrician	4 (20)
Pediatrician	5 (25)
Perinatal Psychologist	2 (10)
Public Health Professionals	2 (10)

^a A trained and skilled independent practitioner who practices in the community setting (e.g., home or birth centers) in the United States, Canada, and/or Mexico who has received certification set by the North American Registry of Midwives (NARM 2019).

^b Advanced nurse practitioners who have obtained a clinical degree, special certification, and training to provide reproductive health and maternity care services either in the hospital or community-setting (Nurse.org 2019).

^c A non-clinical, trained professional “...who provides continuous physical, emotional, and informational support to a mother before, during, and shortly after childbirth” (DONA 2019).

Poor Nutrition

Every participant discussed the connections they see between “bad nutrition” and poor MIH outcomes on the island. Puerto Ricans were described as having what some participants called a “mono diet” comprised of white rice, beans, and meat, where “they don’t eat vegetables or drink enough water.” Participants argued that poor dietary habits were “simply part of life in Puerto Rico” and that these factors contribute to a high prevalence of overweight, obesity, and associated health conditions such as hypertension and diabetes. Celeste, a community midwife who has been practicing for more than twenty years, summarized her perspective on the connection between poor diet, socioeconomic status, culture, and poor MIH outcomes in Puerto Rico:

There’s a lot of government assistance and a lack of education around diet... There are people who just don’t eat vegetables here. They don’t drink water, and they just drink Coca-Cola all day. That is the culture here... The lack of really good nutrients in Puerto Rico is probably one of the biggest causes of a lot of the maternal health issues which shouldn’t be, such as premature labor, high blood pressure, preeclampsia, diabetes... There’s a lot of diabetes here.

Many participants also explicitly discussed the association between poor maternal dietary habits and high rates of obesity, arguing that a fear of large babies and the diagnosis of gestational diabetes leads many doctors to induce early or to encourage women to “just schedule a cesarean.” All

participants described either providing counseling or referring patients for nutritional counseling as part of their prenatal care. While some participants saw poor maternal nutrition as the result of a lack of knowledge around healthy eating, others asserted that poverty and the higher costs of healthy food were to blame. Nonetheless, all agreed that when poor maternal nutrition intersects with a Puerto Rican maternity care system “stretched too thin,” PTB and cesarean section rates rise to higher-than-expected levels, and mothers and babies suffer the consequences of such structural inequities.

Pregnant individuals diagnosed as overweight and obese have, in fact, been shown to have higher rates of maternal morbidities, including gestational hypertension and gestational diabetes, resulting in iatrogenic PTB and cesarean birth (Sinha and Jastreboff 2013). In Puerto Rico, more than 44 percent of pregnant individuals are overweight or obese before pregnancy (Guillot et al. 2015). Guilloty et al.’s (2015) analysis of data from 160 pregnant Puerto Rican women who were participating in an on-going cohort study that focused on diet, body mass index (BMI), and weight gain, identified that the consumption of fruits, vegetables, beans, fish, and milk was very low, while the frequency of the consumption of sodas and fruit juices was high. Fruit juices, Guilloty et al. (2015) argue, are very common in Puerto Rico and are believed to be healthy beverages because they contain fruit. However, the sugar content relative to the fruit content is exceedingly high, and those consuming more than one fruit drink per day had an increased risk of excessive gestational weight gain. The experts we interviewed were familiar with, or researchers on, these studies, and all believed they accurately described the communities they serve. Participants’ narratives call on such research and emphasize “poor diet” as “part of Puerto Rican culture”—a “culture” that emerges from decades of colonial rule and that has dangerous, even life-threatening, consequences for mothers and babies when it intersects with the physiological trajectories of pregnancy and birth.

Water Contamination

Alongside concerns over poor diet, experts also worried about water contamination due to environmental pollution. Puerto Rico has more than 200 Environmental Protection Agency (EPA)-identified contamination sites, many of which are unlined landfills near the karst aquifers on the north coast (PROTECT 2013; US EPA 2017). Participants were aware of these sites and argued that the abundance and location of them means pollution cannot be ignored as a key contributor to poor birth outcomes such as PTB. Gabriel, a pediatrician and public health professional, narrated how the findings from the Cordero (2013) study (see also Ferguson et al. 2019) found no significant relationship between common epidemiological factors associated with PTB in the US and the rate of PTB in Puerto Rico. This prompted researchers to “look at other root factors” such as endocrine disrupting chemicals (EDCs). Gabriel asserts, “What we know from the early data is that, overall, women in Puerto Rico have about three times the level

of phthalates [an endocrine disrupting chemical] relative to women in the US [states].”

Participants also believed that water contamination was implicated in other perinatal conditions associated with PTB such as HELLP syndrome—a variant of pre-eclampsia (Haram, Svendsen, and Abildgaard 2009). Mia, a midwife who works in a combined midwifery and obstetric practice, describes how a personal friend’s experience shifted her mindset about the relationship between maternal health and water quality in Puerto Rico: “I had a very close friend who was very healthy that still ended up with HELLP syndrome, and I thought, ‘well, maybe it’s the water.’ At the very least, it’s the contamination on the island.” Mia, like many participants, continued by arguing that there were multiple, intersecting factors related to poor perinatal health outcomes; “contaminated water is only one of them.”

Existing research supports this syndemic interaction between pregnancy, water contamination, and poor perinatal health, particularly as it relates to maternal BMI and birth outcomes in Puerto Rico. Island-dwelling Puerto Ricans have higher rates of a variety of endocrine-related diseases and disorders compared to populations in the US. However, little evidence exists to demonstrate how EDCs impact human health. Meeker et al. (2013) reports that industrial and consumer EDCs such as triclosan, benzophenone-3, dichlorophenols, and parabens commonly found in consumer goods, such as personal care products, insecticides, food items, and some pharmaceuticals, are detectable in surface drinking water. These chemicals have been shown to have an adverse effect on infant and childhood conditions such as obesity, birthweight, and premature female reproductive development (Bedoux et al. 2012; Braun and Hauser 2011; Calafat et al. 2008; Dann and Hontela 2011; Krause et al. 2012; Meeker et al. 2013; Rubin 2011). Developmental Origins of Health and Disease research suggests that EDCs are *obesogens*—environmental chemicals that stimulate fat accumulation during critical stages of fetal development—with the potential to disrupt lipid metabolism and to promote obesity across the life course (Newbold 2011). Descriptions of water contamination and existing research on the teratogenic effects of such chemicals on maternal metabolism were employed by experts to help explain why Puerto Rican women are subject to multiple, intersecting environmental stressors. Teratogens in the water interface with pregnant people’s individual biologies to increase the risk factors associated with maternal morbidity, preterm and cesarean birth. Poor nutrition further exacerbates this interaction.

Psychosocial Stress

Several participants described various forms of “social stress” as a potential etiology for PTB, cesarean birth, and other poor MIH outcomes in Puerto Rico. Yarelis, a perinatal psychologist, academic, and birth rights activist connected persistent political and economic inequities with prenatal stress, saying, “Women describe their prenatal experience

as stressful. We [Puerto Ricans] are all living in stress right now...we are all low socioeconomic status.” She continued, associating poor MIH with financial struggles and interpersonal stressors such as domestic violence, saying, “A lot of women in their pregnancies are having difficulties with their relationships—so domestic violence or interpersonal, gendered violence. On the whole, Puerto Rico is a very stressful place to be a pregnant woman.” Other social conditions such as loud music and “hearing people screaming all the time” were also thought to contribute to poor MIH outcomes, creating hectic living environments and inevitable social stress. Claudia, a pediatrician and public health professional, connects these omnipresent, everyday stressors to the daily concerns of expecting individuals: “Poor prenatal care, poor nutrition, and water contamination are continuously on the minds of pregnant women in Puerto Rico.”

Experts, in explaining how the patients they care for are constantly under stress, described circumstances conducive to the clustering of chronic stress and poor birth outcomes. Pregnant Puerto Rican women are overwhelmed by “managing work-life balance,” “the intense emotion that characterizes the Puerto Rican people,” and “feeling anxious about the possibility of developing a complication during pregnancy.” For their patients, persistent psychosocial stress was a “normal” part of their life attributable to “the island’s economic and political precarity” and the consequences these could have for them and their families in terms of access to quality education, health care, and job opportunities, as well as financial and personal security. Research on maternal stress and perinatal outcomes support experts’ experiences and interpretations of their patients’ worries. Numerous studies have demonstrated correlations between elevated, chronic maternal stress and poor perinatal outcomes, including PTB, low birthweight, and infant reactivity (Chen et al. 2011; Glynn et al. 2008; Lobel et al. 2008; Wadhwa et al. 2001; Yali and Lobel 1999). The clinical impact of psychosocial stress has been explained using hypothalamic pituitary adrenal (HPA)-axis function and proxy measures of absolute cortisol in women; both high and blunted cortisol levels are associated with elevated levels of perceived maternal stress (Duffy et al. 2018; Russell et al. 2012). Chronic maternal HPA activation is hypothesized to contribute to low birthweight and PTB through biochemical mechanisms that cause increased levels of inflammation in uterine tissues (Gomez-Lopez et al. 2014). Experts interviewed for this study argue that their patients live with extremely high levels of daily stress and that the stress hormones that result intersect with poor diet and contaminated water to produce toxic gestational environments that, quite expectedly, generate poor perinatal outcomes.

Theme 2: *Medicina Defensiva*: Solo Obstetrics and Fear-based Medicine

The constraints of solo practice in a highly litigious society resulted in what experts termed *medicina defensiva* or “defensive medicine.” Participants identified a second layer of interactions under the umbrella term of “defensive

medicine”—that encompass the practices and constraints on the provision of care that they argue characterize obstetric practice in Puerto Rico. These systems-level factors are thought to collide with the individual-level factors described in Theme 1—poor diet, contaminated water, and stress. Specifically, participants elaborated on how the island’s adoption of heavily medicalized obstetric care, once becoming a US colony, has shaped two core aspects of the maternity care system they believe contribute to Puerto Rico’s elevated preterm and cesarean birth rates—solo obstetrics and fear-based medicine.

Solo Obstetrics

The maternal health system in Puerto Rico struggles to function due to low government-funded health insurance reimbursement rates for both vaginal and cesarean births. According to expert interviews, government insurance reimbursement rates range from \$600 to \$1,200 for a vaginal birth, and from \$300 to \$900 for a cesarean birth. Participants reported that cesarean births are reimbursed at \$300 less with the intent to “incentivize vaginal birth.” Compared to the US, these reimbursement rates are shockingly low; average US Medicaid reimbursement rates are \$6,053 for a vaginal birth and \$7,908 for cesarean birth (Truven Health Analytics 2013).

Experts also indicated that despite having more than 500 trained obstetricians on the island, only one-fifth of them practice obstetrics, with the remaining providers offering only gynecological services. Unlike many obstetric and midwifery practices in the United States, where labor and delivery units and birth centers rotate on-call shifts for providers, many providers in Puerto Rico work in high-volume, single-provider practices—one of many key factors that drive burnout rates among obstetrician-gynecologists. “Solo obstetrics” was defined by Luis, a perinatologist, as: “One obstetrician per labor and delivery unit working 300 days a year at a rate of thirty to fifty births per month” in order to “cover costs and to make a reasonable wage working within a system where insurance reimbursement is so low.” Participants explained that solo obstetric practice, and its associated financial burdens, have caused the “quality of maternity services to deteriorate over time.” Celeste, a community midwife, critiques the obstetric system particularly for patients who are higher risk, describing a regimented, routinized practice of maternity care that lacks empathy, patient-centeredness, and evidence-based protocols:

There are lots of overweight women...obese women... They’re not focusing on their health so much because of the lack of care that they’re really getting when they get to an obstetrician, it’s like, “OK, how many weeks are you? Oh 25, let’s do a sonogram. Oh, don’t eat so much! Your blood pressure is a little high, okay see you next time...”

Celeste connects the structure of obstetric medicine in Puerto Rico with maternal morbidities that result from unnecessary interventions, substandard care, and mismanagement of medical complications of pregnancy. She sees these

as ultimately driving the preterm and cesarean birth rates: “And so, you see that [obstetric maternity care] and then the prematurity and the high blood pressure and the diabetes—those are the babies that end up having cesareans.”

All participants were concerned that a higher rate of inductions, especially for first time mothers, led to an elevated rate of “unnecessary cesareans” and PTB. Highlighting the island’s nearly one in two nulliparous, term, singleton, vertex (NTSV) cesarean birth rate, some participants referenced local data, claiming that there were regions of the island where 70 to 98 percent of the births resulted in a cesarean—more than five times the 10 to 15 percent cesarean rate recommended by the WHO and the Human Reproduction Programme (2015) and more than double the rate in the US (CDC 2020). Several participants also identified a connection between the high rate of early induction, often at 37 weeks gestational age, and the high rate of PTB. Camila, a certified nurse midwife, describes this connection: “I learned about the high rate of induction supposedly [at] 37 weeks. And that was assuming it [the fetus] was 37 weeks, though most women don’t know exactly when they got pregnant. It could be a 35 weeker—that’s why we have a high prematurity rate.”

All participants highlighted the need to reduce the cesarean birth rate and understood that “poor health” associated with maternal morbidities such as pre-eclampsia were critical issues to be addressed. Celeste, explained how despite being a home-birth provider, she understands the utility of cesarean birth when necessary, and in her practice, strives to normalize both vaginal and operative modes of delivery: “There are so many reasons why cesareans are necessary. . . . You can still connect with your baby. You can still breastfeed. So, I am trying to learn how I can work with [families] on this so they don’t feel bad or traumatized about it. . . .cesareans actually can save a life.” Despite universal discussion of the need to reduce unnecessary cesareans, while finding better ways to support women who birth surgically, experts expressed frustration with how difficult this task is; the constraints of solo practice are considered a major contributor to the intractability of Puerto Rico’s cesarean birth rate.

In the US, approximately 30 percent of labors are medically induced (Declercq et al. 2013). Elective induction leads to more than 12,000 excess cesarean births, costing nearly \$100 million per year, especially when inductions occur in first time mothers with an unfavorable cervix or before 39 weeks gestation. Labor may be induced after 39 weeks for some logistical reasons, including: risk of rapid labor, distance from the hospital, or psychosocial indications (ACOG 2019; Hutto 2015). In a health care system like Puerto Rico’s, experts worry that these technologies are being overused and misused; they have become normalized because of the significant structural constraints on the availability of providers and clinical resources. Luis, a perinatologist, and other experts further described the conflict between expected versus actual management of care during labor and birth, arguing that the \$300 financial “incentive” for vaginal births (cited above) is an unsustainable rate for encouraging physiologic birth—especially for those patients with government-funded health insurance. “The time-cost-

benefit-liability algorithm for vaginal versus cesarean birth simply does not work out” as Luis noted. Medically managed labors with high cesarean birth rates allow for the maximizations of labor and delivery services with the lowest number of providers in the shortest amount of time.

Solo obstetrics is the first iatrogenic interaction within this syndemic, which is characterized by induction and other overuses of interventions that contribute to elevated cesarean and PTB rates. However, participants also noted that, at the same time, many pregnant Puerto Ricans have medically complicated pregnancies because of the chronic health conditions described in Theme 1. Poor nutrition, water contamination, and high levels of psychosocial stress before and during pregnancy bring women with risk factors and potentially unhealthy pregnancies (as well as those with healthy pregnancies) into contact with a deeply under-resourced perinatal health care system. As Claudia, a pediatrician and public health professional noted, “It should surprise us that *anyone* in Puerto Rico has a healthy pregnancy and a physiologic birth and not that so many have preterm births and cesareans.”

Fear-based Medicine

Participants characterized Puerto Rico’s medical system as functioning within a “fear-driven culture” that encourages providers to shape their practice in response to the fear of litigation related to medical malpractice. In Puerto Rico, health insurance companies, their lawyers, and existing legislation effectively force providers to practice medicine with an emphasis on minimizing liability. Luis, a perinatologist, describes why maternity care providers are afraid of being sued as a result of the high liability associated with obstetric practice in Puerto Rico: “Here, you have the right to sue anyone. . . .and they sue you for whatever they want \$2,000,000, \$4,000,000, \$5,000,000. In the end, we settle, because if not, I shut down my office for five days for a trial. . . . Then I have to pay someone to cover all of my calls. So, the quantity of money I am going to lose, it’s humungous, and the lawyers know that!”

Some participants also described the ways that the practice of fear-based medicine can result in “provider-patient aggression,” particularly for patients who question the clinical need for an intervention such as a cesarean birth or when requesting information about vaginal birth after cesarean (VBAC). Others argued that providers used liability as an excuse to control birth “for [their] own convenience.” Mia, a midwife from a combined physician-midwife practice, described the ways women wanting VBACs are harassed and threatened by providers: “You are too small, you are too big, you don’t have enough amniotic fluid, or your baby’s going to die!” Luis explained from the physician’s perspective why the topic of VBACs can be particularly triggering for obstetric providers:

Ninety-nine percent of OBGYNs do not want to do VBACs, and its simply because of liability. Liability is very high, and now you have patients attempting a

vaginal delivery versus 45 minutes with a cesarean birth, so it's [operative births rather than VBACs] are more cost effective. They're [the patients] are not going to sue you for a cesarean, they're going to sue you for the vaginal delivery where you didn't perform a cesarean on time.

Participants also described how lawyers and the legal system, rather than the physicians, were ultimately responsible for medical decision making, as, in the words of Maria, a pediatrician, "health insurance companies rule the Puerto Rican health care system." From the perspective of participants, defensive medicine, a culture of fear, and solo practice combine to produce a perinatal health care system that does not center evidence-based, patient-centered care and that drives preterm and cesarean birth rates to dangerous levels.

Fear-based medicine intersects with the dynamics of solo practice to create iatrogenic risk factors—that is, they emerge from the maternity care system itself and influence the standards of care that make a perverse kind of sense within Puerto Rico's largely dysfunctional structures. A recent estimate indicates that there are approximately 1,000 medical malpractice lawsuits on the island each year—900 of which are dismissed (AP News 2018). Despite this seemingly small number of lawsuits, given that there are only 500 obstetric providers on the island, fear of litigation continues to shape practice in ways that prioritize a live infant at any cost to the mother or her rights to autonomy and respectful care. The form obstetric practice takes in Puerto Rico is particularly concerning given the increased probability that pregnant individuals will develop complications that may require more extensive medical monitoring and intervention. The combination of individual- and systems-level vulnerabilities described by experts in Themes 1 and 2 exacerbate one another, thus producing an imbricated syndemic of poor perinatal health outcomes. Fortunately, participants also had ideas about what could be done to improve the situation.

Theme 3: *Medicina Integrada*: Midwives, Doulas, and Comprehensive Re-education

Participants described two solutions to the syndemic of poor perinatal health outcomes that characterize the Puerto Rican MIH system: (1) legal recognition of additional maternity care options, including midwives and doulas; and (2) increasing patient and provider educational initiatives designed to convey the benefits of preventative medicine and "right-sized" maternity care. Maternal and infant health care (MIH) experts argued that prevention was better than intervention and that individualized approaches tailored to patient need was optimal for maternity care but that these strategies would require "a team-like mindset between providers." Obstetricians cannot be "pinpointed" as the sole, liable providers "left to intervene downstream" or late in the progression of a complication/health problem. A wider range of caregivers, such as doulas and midwives, must be acknowledged, regulated, and integrated into the system of maternity care. In addition, both patients and providers must begin to see the

benefits of preventative care that is better aligned to the risk level and preferences of pregnant individuals.

Adding Midwives and Doulas to the Maternity Care Team

Participants argued that to improve MIH outcomes, there needed to be stronger collaborations between obstetricians and midwives working in both hospital and community settings (home and freestanding birth centers). Currently, in Puerto Rico, midwifery practitioners have no legal protections nor hospital privileges despite research showing similar, and for some variables, improved outcomes for healthy individuals without medically complicated pregnancies (NASEM 2020). Understanding the potential for collaborative partnership, Hector, an obstetrician known for his support of community birth, described the dangers of a maternity care system that does not prioritize integrated care: "We, the doctors [obstetricians], cannot destroy the midwives, and the midwives shouldn't destroy the doctors... The safest thing for our communities is that everything is integrated, not polarized.... In reality, what puts the family in danger is the lack of communication and the discoordination of the health system." Other providers suggested the incorporation of non-clinical providers, such as birth doulas (DONA 2019) and community health workers into the health care team, as existing research shows that women who have access to doula care are more likely to have unmedicated, spontaneous vaginal births; to initiate and sustain exclusive breastfeeding; and to report being satisfied with their birth and early parenting experiences (Bohren et al. 2017; Kozhimannil et al. 2013; Kozhimannil et al. 2016).

Comprehensive Re-education

Participants also indicated that more educational initiatives for providers and pregnant individuals and their families could improve MIH outcomes. For pregnant individuals and their families, several education initiatives were suggested with "the goal of empowering families." Luna, a pediatrician, asserted that if you are "an educated woman...nobody will mess with you." Providers overwhelmingly agreed that more and higher quality education related to reproductive and general health care, particularly for low-income and young families, would be transformative. Educational outreach was emphasized in expert narratives, with many arguing that doctors do "whatever they want with them [poor women]," ultimately decreasing their access to quality perinatal care. Providers described how the lack of information regarding VBAC and PTB was especially problematic for these populations who often had limited access to information and informed consent around these topics. Luna, one of the biggest advocates for education as a tool of empowerment for women, families, and communities, discussed how the issue of PTB in Puerto Rico has contributed to the misperception of a what a "healthy baby" looks like: "...I think we should empower people to understand...the look of a 40-week-old baby...it's not a smooth-skin baby you know...that is a 36

weaker. We are losing that already, our women, they don't know what a healthy, term newborn should look like, and that is very scary." While no one argued that education alone was enough to improve MIH outcomes in Puerto Rico, all participants recognized a critical need for better access to information around a wide range of birth and parenting topics.

In addition to educating consumers, provider educational initiatives were also called for. Many participants suggested that nurse and physician education be offered with an emphasis on maternal mental health screening; the benefits of maternal-infant contact in the neonatal intensive care unit (NICU); the benefits of undisturbed, physiologic birth for healthy women; and breastfeeding support strategies. In addition, trainings could focus on the benefits of integrated and expanded perinatal health care options, such as midwifery and doula care. Obstetricians in this study noted that the politics of birthing on the island have disrupted relationships between doctors, midwives, and doulas. Hector, an obstetrician, argued, "Midwives and obstetricians need to understand the limitations, benefits, and practicalities of what each type of provider has to offer." Providers must also be able to come together to discuss what an integrated maternity care system might look like in Puerto Rico. Experts agreed that social support was critical. As Ivan, a pediatrician said, "More support leads to better outcomes" but only within "a system that believes that laboring women *deserve* this support." Collectively, participants argued that integrated maternity care was a critical solution to poor perinatal health outcomes in Puerto Rico and recognized the need for more opportunities to share information and develop collaborative strategies that would ultimately convince governing officials to support a more diverse and integrated model of care as has been achieved in some states within the US (Vedam et al. 2018).

Discussion

Expert interviews generated three core themes—two that describe the risk factors that they believe are associated with elevated rates of preterm and cesarean birth in Puerto Rico and one focused on potential solutions: (1) *Los estresores diarios: Poor nutrition, contaminated water, and psychosocial stress*; (2) *Medicina defensiva: Solo obstetrics and fear-based medicine*; and (3) *Medicina integrada: Midwives, doulas, and comprehensive re-education*. In Figure 1, we illustrate how elevated preventable death and suffering emerge from two key sites of interactions described by MIH experts—the maternal body and the perinatal health care system. The upper portion of Figure 1 illustrates how perinatal morbidities develop from the clustering of everyday exposures like poor diet, contaminated water, and high stress levels. Then, as the pregnant person engages with the maternity care system, individual-level factors collide with the systemic constraints produced by solo practice and fear-based medicine (bottom portion of Figure 1). Together, these generate iatrogenic effects for already vulnerable mothers and babies that result in poor perinatal health outcomes. All these interactions emerge

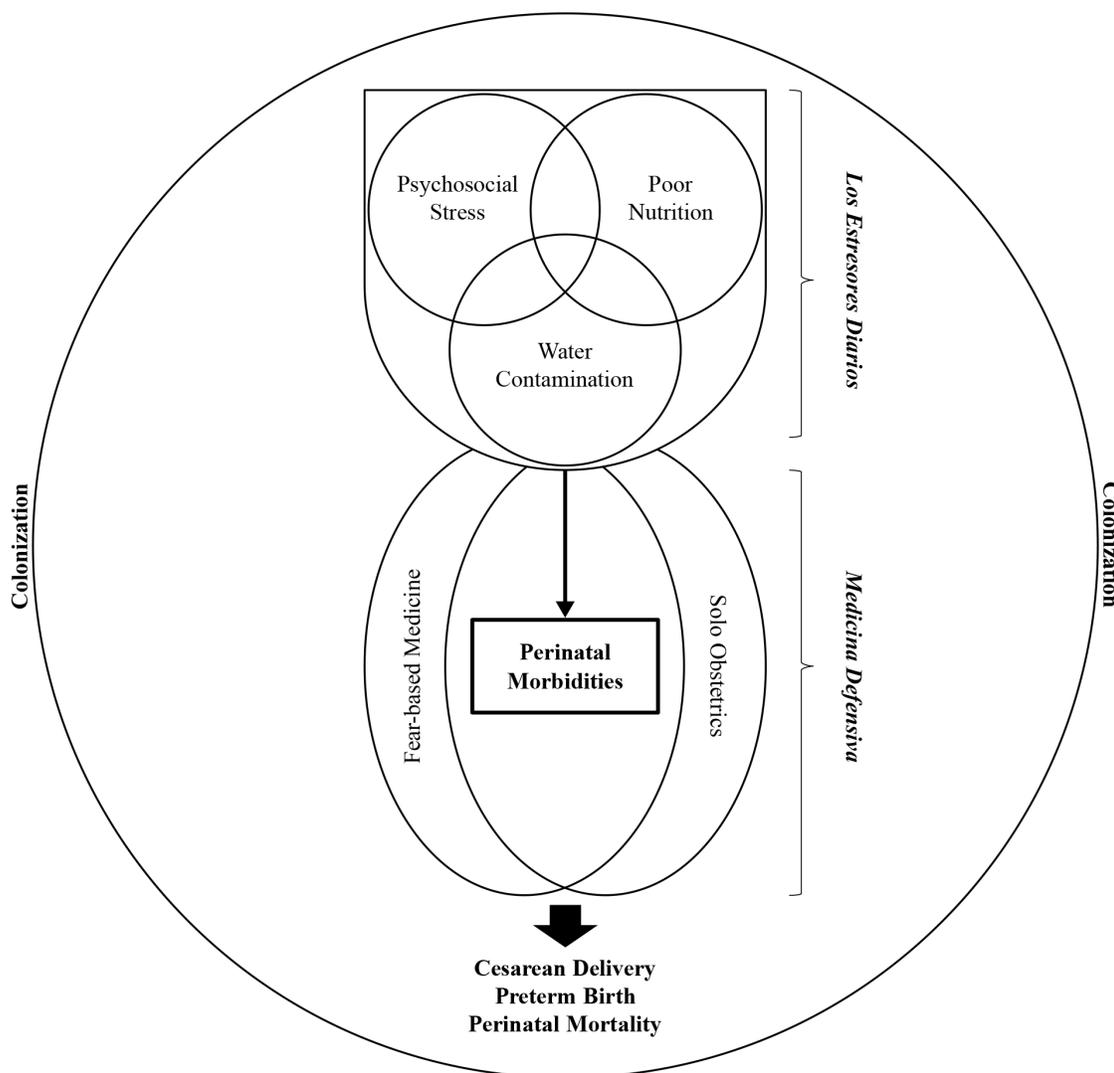
from the island's historical and current status as a US colony as modeled by the outer circle encompassing the syndemic clusters in Figure 1.

Lerman (2016) has proposed a similar syndemic—termed the OVIDD Syndemic (Obesity, Violence, Political Instability, Diabetes, and Depression)—wherein she argues that "Puerto Rico's political subalternity" produces stressful environments conducive to the consumption of calorie-dense, low-nutrient food sources, and reduced levels of physical activity. High levels of obesity and diabetes result. In addition to this Puerto Rico-specific syndemic, syndemics of pregnancy (Everson and Ostrach 2017; Mendelhall 2012; Martinez et al. 2017, 2018a, 2018b; Ostrach and AbiSamar 2017; Singer 2013) have been developed to explain how gestation may function as a site where the maternal body becomes pathologized (Ostrach and AbiSamar 2017).

Everson and Ostrach (2017) have proposed a syndemic model for teen pregnancy where the lens of social stigma produces the perception that adolescent birth is dangerous, undesirable, and pathological. Harm flows from the over-intervention and shaming that result, and this "biosocial pathologizing" of teen pregnancy yields a syndemic of poor birth outcomes for adolescent mothers (Everson and Ostrach 2017). In Puerto Rico, births are not stigmatized in quite this way, yet similarly, we identify a sociopolitical locus for the production of perceived pathology that then collides with a broken maternity care system, resulting in the clustering of factors stemming from the injustices produced by on-going colonialization. Findings from our study integrate insights from the OVIDD syndemic in Puerto Rico, and the syndemics of pregnancy more generally, yet also reveal the need to center the on-going impacts of colonization and the various forms of inequality—economic, environmental, nutritional, reproductive, etc.—that result and undergird the production of poor perinatal health syndemics in Puerto Rico.

Syndemics theory provides a useful framework for examining complex interactions between individual biology, health outcomes, cultural and environmental contexts, and the political-economy of disease and suffering in disenfranchised populations globally. Our work with Puerto Rican MIH experts further informs the theoretical development of syndemics by centering colonialism and the historical development of unequal relations of power that continue to shape MIH outcomes in the present. While sociopolitical elements are commonly integrated into syndemic models, factors like colonization or globalization are typically considered as components of a cluster of interactions, rather than as the foundation, the precondition, from which the syndemic emerges or manifests. The relative weighting of contributing factors, and the patterned (and sometimes sequential) interaction of such factors, can produce syndemic pathways that require more complex modeling—modeling that extends beyond two (or more) circles/factors interacting to produce a health outcome. Syndemic modeling may be expanded to incorporate layers of interactions or multiple syndemic nodes—that is, interactions of interactions—that impact individual bodies and the

Figure 1. A Syndemic of Poor Perinatal Health Outcomes in Puerto Rico. The syndemic of poor perinatal health outcomes illustrates how the iatrogenic factors of solo obstetrics and fear-based medicine interact with everyday stressors and resulting maternal morbidities that contribute to the increased likelihood of preterm and cesarean birth in Puerto Rico.



systems they navigate. In the syndemic of poor perinatal health outcomes identified for Puerto Rico and modeled here, the context of colonialism enables compounding clusters of factors that intersect to produce high rates of preterm and cesarean birth that drive poor MIH outcomes.

Syndemics researchers have recently begun to examine how best to incorporate this approach into clinical and public health settings (Hart and Horton 2017; Mendenhall 2017; Singer et al. 2017; Tsai et al. 2017). Participants in this study were largely located in these areas, and their abilities to identify intersecting factors suggests that fruitful collaborations between clinicians and researchers are possible using a syndemics approach. However, this project also

highlights another important possibility for the application of syndemics in applied medical anthropology work. Participants in this study did not want to discuss problems or challenges alone but call us to recognize that they are also positioned to offer potential solutions. As they interface with the various components or sites within a syndemic, they develop a knowledge and skill set as well as exposure to hundreds of patients' experiences that uniquely position them to identify solutions and interventions, especially when these perspectives are analyzed in tandem with those who are receiving (or not receiving) the types of supports and care that may mitigate the harmful implications of the syndemic being studied. In this way, participants play a role in exposing

insidious etiologies, as a syndemic framework allows, while also helping to shape solutions. As Singer and colleagues note (2017:947), a syndemic approach that moves beyond recognizing the biosocial factors that affect health to include a focus on the ways "...non-pharmacological interventions, can severely change health outcomes."

Conclusion

Expert narratives describe a syndemic of poor perinatal health outcomes in Puerto Rico that emerge from the layered clustering of historical, institutional, and environmental factors that contribute to the island's elevated preterm and NTSV cesarean birth rates. These factors extend beyond common epidemiological variables that predict such outcomes in the US, highlighting the ways poor perinatal health and its associated etiologies must be nuanced to the Puerto Rican context and the implications of its perpetual colonial status. The syndemic we propose here is predicated on colonial, political-economic inequities that affect both providers and patients.

Participants also suggest that Puerto Rico might benefit from the expansion of maternity care options to include both community- and hospital-based midwifery and doula care, as well as the comprehensive re-education of providers and birthing families. Educational initiatives might allow pregnant individuals and MIH experts to collaborate across power dynamics more effectively with the shared goal of eliminating the syndemic of poor perinatal health outcomes. While we recognize the "need to start somewhere" as conveyed by the MIH experts in this study, the syndemic model we generated also suggests that perinatal health may not improve until the underlying conditions of colonization in Puerto Rico are redressed. In the words of Claudia, a Puerto Rican pediatrician and public health professional, "If we don't work to uproot the deeper causes of poor health on this island, we will never solve *la crisis de la atención de maternidad*."

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